

# The Stanford Dosimetry Algorithm Application

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## Abstract

The Stanford Dosimetry Algorithm Application is a tool for calculating radiation doses and testing dosimetry algorithms. In the summer of 2009, a new version of the application was released, emphasizing speed and modularity. This document will help get the software up and running, as well as clarify the application's features.

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# 1 Setup

A distribution of the Stanford Dosimetry Algorithm Application consists of a compressed directory, containing four subdirectories and an executable. To set up the software, do the following:

- Extract the installation package to the desired directory, e.g. `C:\Program files\SD\`
- Run the `SD Algorithm Application.exe` file, granting permissions as necessary. The first time the application loads, the user will be prompted for a product key. Keys are distributed by Stanford Dosimetry.
- *(Optional)* Add a shortcut to the Start menu by right-clicking the `SD Algorithm Application.exe` file, and selecting “Pin to Start menu”.

# 2 Use

The user interface is designed to be intuitive. Nevertheless, a brief introduction to the software follows. Instructions are organized by screen, and tips are included that experienced users may find useful.

## 2.1 Algorithm selection screen

Once the product key has been verified, the application loads an algorithm selection screen. All included algorithms are displayed as buttons. Select the relevant algorithm to proceed to the main screen.

## 2.2 The main screen

This is the “operating theatre” of the application. From here, routines are available to specify options, calculate doses, test algorithms and run batch files. These tools are organized in four tabs, whose functionality is described below.

### 2.2.1 Options tab

This is the first tab that loads. It allows the user to customize certain features of the software, as well as choose input parameters for the algorithm.

**Global Options** If text is entered in the “Description for dose results” text box, or the “Name, or initials” text box, the contents are copied to the end of the batch file output as a record. The units box allows the user to choose the system by which doses are reported. This option is applied globally, in the sense that all doses will be reported in the units selected here. Existing calculations are automatically updated when the unit system is changed, to reflect the same physical dosage in the new unit system. The application remembers the chosen unit system after the program is closed.

**Batch File Options** If the box is checked, the user will be prompted for backgrounds and correction factors when running a batch file. If the box is not checked, the backgrounds will be taken to be 0, and the correction factors 1.

**Algorithm Options** The options displayed here depend on the specific algorithm in use. Options may include path options, beta options, neutron options, and a checkbox for reporting alternative predictions based on a purely linear algorithm. More specific information can be found in the individual algorithm documentation files.

### 2.2.2 Responses tab

This tab is intended for quick and easy access to the algorithm. Once element responses have been entered (along with optional background values and correction factors), select the “process” menu to run the algorithm. A summary of the results will appear on the lower half of the screen.

**Detail button** Clicking this button displays a popup form with a full variable report of the algorithm’s calculations. Intermediate variables and other relevant parameters are included in this report. To close the popup, click the “Detail” button a second time.

### Tips

- Element responses can be copied and pasted from Excel into the response boxes, all at once. Select all of the element readings (arranged in a row) in an Excel spreadsheet, and paste them into the leftmost textbox. The same trick works for the background and correction factors.
- Similarly, the information from the detail popup can be copied and pasted into an Excel spreadsheet.

### 2.2.3 Responses tab

This tab allows the user to “irradiate” a hypothetical dosimeter with different fields, then synthetically test the algorithm’s performance by checking its predictions against the applied sources.

To make this work, a response file, listing dosimeter responses to various sources, must be loaded. In most cases, this should be done automatically. At the top left corner of the screen, the name of the currently-loaded response file is presented, and the box below it lists the different fields available from the given response file. If nothing is listed, or if the user wants to switch response files, select the “change” button, and browse to the new response file.

Once the box is populated with a list of fields, the user can “irradiate” an imaginary badge by selecting a field, specifying a shallow dose and clicking the “Add” button. Once this button is clicked, the field and dose are added to the “Summary of Entered Doses” box, and the calculated element responses are updated. The algorithm’s predictions (based on the calculated element responses) are displayed below, along with percentage discrepancies from the “delivered” doses.

Multiple fields can be added sequentially. All sources are cleared when the “Clear” button is clicked.

#### Tips

- Fields can be added or removed quickly by double-clicking the name.
- The detail box works in the same way as on the Responses tab.
- The element responses can be adjusted (to simulate noise, for example) manually. After the number has been updated, click elsewhere on the screen (or hit TAB) to refresh the algorithm’s calculation.

### 2.2.4 Batch file tab

This tab makes it possible to process large numbers of element responses rapidly. The first step is to load the response data. There are two ways to do this. The easiest method is to select the data in an Excel spreadsheet (or tab-separated text file), copy it, then paste the data into the input box by selecting the “Paste from clipboard” button. Input can also be loaded from a comma-separated text file (e.g. a .csv file). In either case, the data must be

arranged in columns, as follows:

*Comment, Element1, Element2, Element3, ...*

For example, correctly formatted input might consist of the following:

```
badge1, 15.7, 12.5, 10.4, 6.7
badge21, 45.8, 12, 10.67, 5.1
badge17, 6.1, 5.67, 4.7, 3.86
```

Once the data has been pasted from clipboard, or the file has been selected, the application will attempt to parse the input. The results will be displayed in the upper box. If some rows are formatted incorrectly, the program will warn the user, and the offending rows will be skipped.

If the file input file was loaded correctly, the user can select “Process” to run the algorithm on the input. The results will populate the lower box. The results can be saved to a CSV text file by selecting the “Save output” button.

### Tips

- The input and output can be copied and pasted into Excel. First, click anywhere inside the input or output box, then send the data to the clipboard via **Ctrl+A**. Finally, copy using **Ctrl+C**.
- As an alternative to clicking the “Paste from clipboard” button, click the input box, then press **Ctrl+V** to enter input data.
- As an alternative to clicking the “Save” button, click the output box, then press **Ctrl+S** to save output.
- To change the variables that get reported, click Choose Output Variables, from the Edit menu.

## 2.3 Menu Options

**File** Select “Restart” to close the current algorithm and select a different algorithm. Select “New Group” to clear session data and start a new instance of the same algorithm.

**Edit** Click “Change Product Key” to enter an updated product key. Click “Select Output Variables” to choose which variables get displayed in the detailed dose report, and on the batch file.

### 3 Adding new algorithms

New algorithms are distributed from Stanford Dosimetry in the form of Windows DLL files, of the form `algorithmName.dll`. Usually, algorithms are packaged with documentation files (.pdf) and response files (.csv). To integrate the new algorithm with the application:

- Copy the .dll file to the `algorithms` directory.
- Copy the .pdf documentation file (if included) to the `documentation` directory.
- Copy the .csv response file (if included) to the `response files` directory.

When the application next starts, the new algorithm will be offered as an option in the initial selection screen.